

# AP World History

## The “Second” Industrial Revolution

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The Industrial Revolution marked the beginning of a massive transformation of the world. In the 19<sup>th</sup> century the technologies discussed in Chapter 23—textile mills, railroads, steamships, the telegraph, and others—spread from Britain to other parts of the world. By 1890 Germany and the United States had surpassed Great Britain as the world’s leading industrial powers. Small companies, like those that flourished in Britain, were overshadowed by large corporations, some owned by wealthy capitalists, others (especially in Russia and Japan) by governments.

Industrialization did not consist only of familiar technologies spreading to new areas, but also of entirely new technologies that revolutionized everyday life and transformed the world economy. The motive force behind this **second phase of industrialization** consisted of deliberate combinations of business entrepreneurship, engineering, and science, especially physics and chemistry. The first Industrial Revolution<sup>1</sup> that you read about in Chapter 23 also involved the interactions of science, crafts, and business through the friendships of people with different interests, as in the Lunar Society. By the mid-19<sup>th</sup> century this potent combination was institutionalized in the creation of engineering schools and research laboratories, first in Germany and then in the United States. Electricity and the steel and chemical industries were the first results of this new force. Let us turn first to the diffusion of earlier technologies, and then to the newer industries of the late 19<sup>th</sup> century.

By the mid-19<sup>th</sup> century, steam engines had become the prime mover of industry and commerce. Nowhere was this more evident than in the spread of **railroads**. By 1850 the first railroads had proved so successful that every industrializing country, and many that aspired to become industrial, began to build lines. The next fifty years saw a tremendous expansion of the world’s rail networks. After a rapid spurt of building new lines, British railroad mileage leveled off at around 20,000 miles (over 32,000 kilometers) in the 1870s. France and Germany built networks longer than Britain’s, as did Canada and Russia. When Japan began building its railway network in the 1870s, it imported several hundred engineers from the United States and Britain, then replaced them with newly

trained Japanese engineers in the 1880s. By the early 20<sup>th</sup> century, rail lines reached every city and province in Japan.

The largest rail network by far was in the United States. At the end of its Civil War in 1865 the United States already had 35,000 miles (over 56,000 kilometers) of track, three times as much as Britain. By 1915 the American network reached 390,000 miles (around 628,000 kilometers), more than the next seven longest networks combined.

Railroads were not confined to the industrialized nations; they could be constructed almost anywhere they would be of value to business or government. That included regions with abundant raw materials or agricultural products, like South Africa, Mexico, and Argentina, and densely populated countries like Egypt. The British built the fourth largest rail network in the world in India in order to reinforce their presence and develop trade with their largest colony. Until the opening of the Panama Canal in 1915, a railroad across the isthmus carried freight between the Atlantic and Pacific Oceans.

With one exception, European or American engineers built these railroads with equipment imported from the West. In 1855, barely a year after Commodore Perry’s visit, the Japanese instrument maker Tanaka Hisashige built a model steam train that he demonstrated to an admiring audience. In the 1870s the Japanese government hired British engineers to build the first line from Tokyo to Yokohama, then sent them home again as soon as they had trained Japanese engineers. Within a few years, Japan began manufacturing its own equipment.

Railroads consumed huge amounts of land. Many old cities doubled in size to accommodate railroad stations, sidings, tracks, warehouses, and repair shops. In the countryside, railroads required bridges, tunnels, and embankments. Railroads also consumed vast quantities of timber for ties to hold the rails and for bridges, often using up whole forests for miles on either side of the tracks. Throughout the world, they opened new land to agriculture, mining, and other human exploitation of natural resources, whether for the benefit of the local inhabitants, as in Europe and North America, or for a distant power, as in the colonial empires.

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<sup>1</sup> Bulliet discusses the Industrial Revolution to 1850 in an earlier chapter.